CHAPTER 13

EL Wire Dress

It is hard to deny that LED dresses look cool, but designing with LEDs might seem a bit limited because if LEDs are placed too far from the microcontroller, construction often becomes more complex. Even with highly conductive thread, the length of the thread becomes an issue if you use threads that are too long because the thread can’t carry the current needed to power the LEDs. Making long connections in wearables is also always a problem because it adds to the chances of the connections breaking.

In this project, we will focus on another dress that lights up, but instead of using LEDs, we will use EL wire. EL wire follows the same principles as the EL panels used in the solar-powered glow-in-the-dark project. EL wire offers a different range of creative freedoms than the use of LEDs and creates a different feel to your creation.

We will learn how to move beyond LilyPads and standard Arduinos, and use a board called an EL sequencer, by SparkFun, which is specially designed to power and control EL wire. The project also introduces alternative construction methods in implementing electronics into garments.

Materials and Tools Needed

The following materials and tools are needed to create your EL wire dress:

- EL sequencer
- 9V battery clip
- 12V inverter
- 4 EL wires, 3 meters each
- Fabric
- Velcro
- FTDI basic serial to USB converter or USB serial light converter
- 3.7 LiPo battery
- 6-pin male pin headers
- Male DC connector
- Eyelets and punch
- Sewing elastic approximately 0.5 centimeters (0.2 inches)
**EL Wire**

EL wire is short for *electroluminescent wire*, which consists of a thin, copper core coated with phosphor. When an alternating current is applied to it, it glows. EL wire is used in vehicles, decoration, safety signs, toys, and more. What makes EL wire special is that it produces a 360-degree light source; it is also flexible. Most EL wires operate between 20 and 220 volts, but the optimum operating range is around 120 volts.

Figure 13-1 shows what's on the inside of the EL wire. In the center, you find copper core, which is covered with phosphor. The phosphor is then wrapped with a very fine copper wire. This is covered with a see-through protective sleeve. The last layer is the PVC, which gives the EL wire its color. When electricity is applied to the copper core and the fine copper wire, electrons jump from one side to the other, and when they do, they activate the phosphor, which makes it glow.

![EL wire parts diagram](image)

**Figure 13-1. EL wire parts**

EL wire can be cut in any length you want, but beware that it is very tricky to solder connectors because they need to be attached to the very thin copper wire and the core in the center without touching one another. We will use 3m EL wire, which can be purchased with pre-soldered connectors.

Later on when you power up the EL wire for the first time, note that the inverter will make noise; there is nothing wrong with it, so don’t be afraid—this is perfectly normal (see Chapter 6 for more on EL inverters). EL wire works at 200Hz to 1000Hz, which means that the inverter is switching on and off very fast. This is known as oscillating; and it’s this oscillating of the power that generates the nice glow.

**The Dress Design**

The inspiration for this project actually came from the fabric satin. Satin is a weaving technique that uses a minimal amount of interlacing fibers and is made from materials like nylon, polyester, and silk. By using very fine fibers and a minimal amount of interlacing, it is possible to produce very thin and smooth textiles such as satin. It’s usually recognized by its glossy surface.

The problem with thin materials like satin when it comes to wearables is that it is hard to use any electronics with them since they are quite sensitive, and it’s very easy to rip holes in the material. So the idea behind this dress is to divide it into two major parts, where both parts will be merely wrapped together instead of being attached together. One part is the dress itself and the other part is all of the